



New Sunflower Germplasm Holds Its Own Against Head Rot

Scientists are hoping the seed of three new sunflower germplasm lines will sow greater success in fighting the fungus that causes head rot. Agricultural Research Service (ARS) and North Dakota State University (NDSU) scientists at Fargo and Carrington cooperatively developed, tested, and released the sunflower lines for their resistance to *Sclerotinia sclerotiorum*, the culprit behind head rot.

Sclerotinia can cause both head and stalk rots in sunflower, making it double trouble. Recently, between 5 and 8 percent of the U.S. sunflower crop, especially in the Northern Great Plains, was affected by these two diseases, with losses reaching \$100 million in peak years like 1999.

Sclerotinia head rot happens less often, but it's just as destructive, since infected flower heads can disintegrate before harvest. "Even slight head-rot infections, while not substantially reducing yields, will cause discolored seeds, which for the confection sunflower, may mean rejection by processors," explains Tom Gulya, a plant pathologist at ARS's Red River Valley Agricultural Research Center, in Fargo. The fungus "also produces sclerotia that can be the same size and shape as the seed." Though nontoxic to consumers, the hard sclerotia sometimes end up in confection seed and can chip a tooth if bitten.

Gulya, ARS plant geneticist Jerry Miller, and NDSU colleague Bob Henson used conventional breeding techniques to develop the three germplasm lines' improved resistance to head rot using French, Russian, and other sunflower sources. Gulya cautions that the lines aren't immune to head rot, but are significantly more resistant than existing germplasm, a feature that's sure to aid sunflower growers. "Breeders working on other *Sclerotinia*-prone crops are also making progress," Gulya adds, "but they can't yet claim total immunity to this pathogen."

In field trials from 2000 to 2002, experimental hybrids with germplasm line RHA 440 yielded 2,086 pounds of seed per acre; hybrids with RHA 439 yielded an average of 1,914 pounds per acre; and hybrids with HA 441 yielded 1,745 pounds per acre. Three commercial checks yielded 1,969 pounds per acre. Since head rot outbreaks in the field are too sporadic, the researchers relied on NDSU's *Sclerotinia* Mist Nursery at Carrington—coupled with artificial inoculation techniques devised by Gulya and NDSU associates.

Head rot resistance is tested by spraying sunflower heads with lab-produced ascospores, an infectious stage of *Sclerotinia*. Immediately afterwards, the mist system is turned on, and it runs intermittently around the clock for the next 3 weeks. By then, heads are showing varying amounts of rot, and the researchers start taking notes. Over 3 years of such testing, the average disease incidence in line RHA 440 was 33 percent; in RHA 439, 16 percent; in HA 441, 8 percent; and in the commercial checks, 58 percent.

Gulya and Miller estimate it could take seed companies 3 to 5 years to incorporate head-rot resistance from the lines into commercial hybrids. Breeders will also have to incorporate high oleic acid content, resistance to imidazolinone herbicides, and other mandatory agronomic traits to satisfy today's growers' needs, they add.—By **Jan Suszkiw**, ARS.

This research is part of Plant Diseases, an ARS National Program (#303) described on the World Wide Web at www.nps.ars.usda.gov.

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